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FACTSHEET

PADDY RICE MANAGEMENT PRACTICES TO PROTECT WATER RESOURCES IN THE LOWER MONDEGO VALLEY: DRY SEEDING WITH DELAYED FLOODING IRRIGATION (DFL)

What is DFL?

DFL – Dry seeding with delayed flooding has emerged as a promising alternative crop establishment method and is increasingly considered a climate-smart management strategy for rice production; it is a practice characterized by dry sowing and delayed flooding until the crop reaches the 3 to 4 leaf stage (tillering stage); after this first irrigation, the field remains permanently flooded until the grains mature; paddies are only drained for a few days in case pesticide or fertilizer treatments are needed during the flood period. Compared to WFL practices, the DFL system can reduce the use of irrigation water, mainly by reducing losses due to surface drainage; however, late flooding can affect crop establishment and early vegetation development due to soil moisture deficit, particularly in years of reduced precipitation in April and May; during the flooding period, controlling the water level is crucial for good irrigation management. This Factsheet reports on the experimental study of the DFL carried on in Lower Mondego Valley.

EXPERIMENTAL SCHEME

One Rice Pilot Farm was monitored during the period 2023-2025, observing the field water level (FWL), irrigation depth, crop evapotranspiration, precipitation during crop season, and paddies surface drainage. The paddy water balance method was applied to calculate deep percolation. Crop monitoring and production measurements were conducted. Several physicochemical parameters were observed, such as electrical conductivity, ammoniacal nitrogen, and nitrates, being the layout of water monitoring at farm level presented in Figure 1. Figure 2 shows the dry seeding operations, and Figure 3 shows examples of FWL data comparing DFL with conventional WFL.

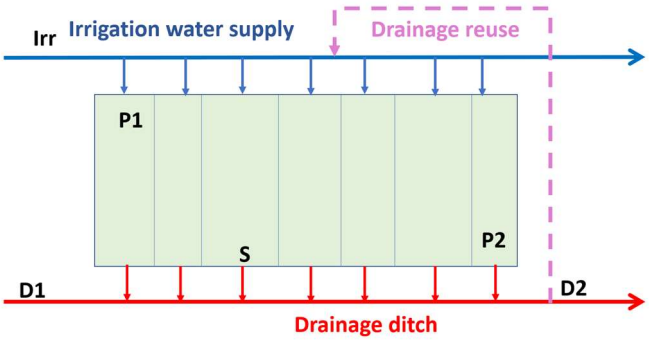


Figure 1 – Layout of water monitoring at farm level. Legend: Irr - irrigation depth, D1, D2 – upstream/ downstream, surface drainage ditch, P1, P2 – upstream/downstream subsurface water collected through piezometers 2.5 m depth, S = paddy surface drainage.

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Figure 2. Dry seeding operations adopted under delayed flooding (DFL) management in the experimental rice fields.

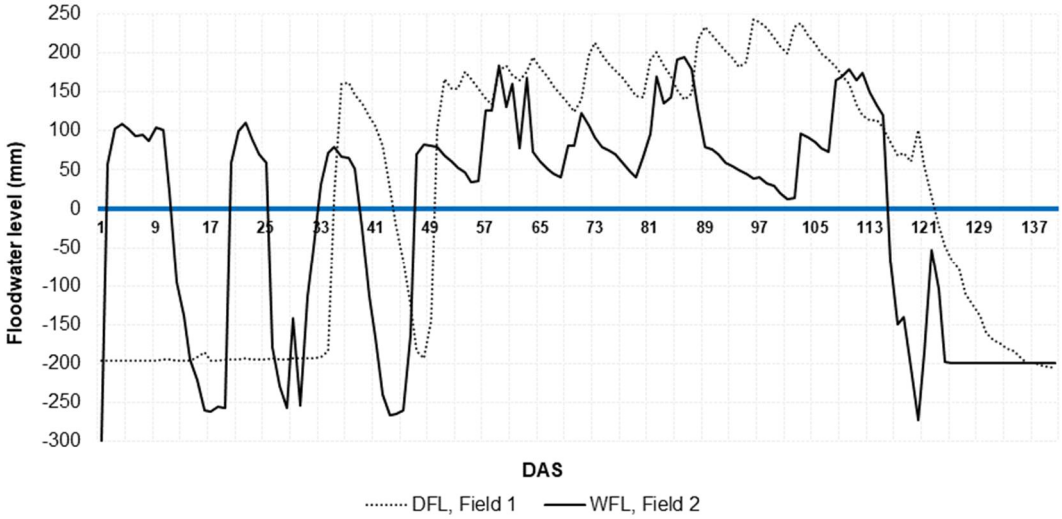


Figure 3. Example of floodwater level above and below the soil surface (mm) under WFL and DFL irrigation management. DAS: days after sowing.

EFFECTS ON IRRIGATION WATER USE AND ON LAND PRODUCTIVITY

Water irrigation use average results are presented in Figure 4, and the average values of yield or land productivity are presented in Figure 5.

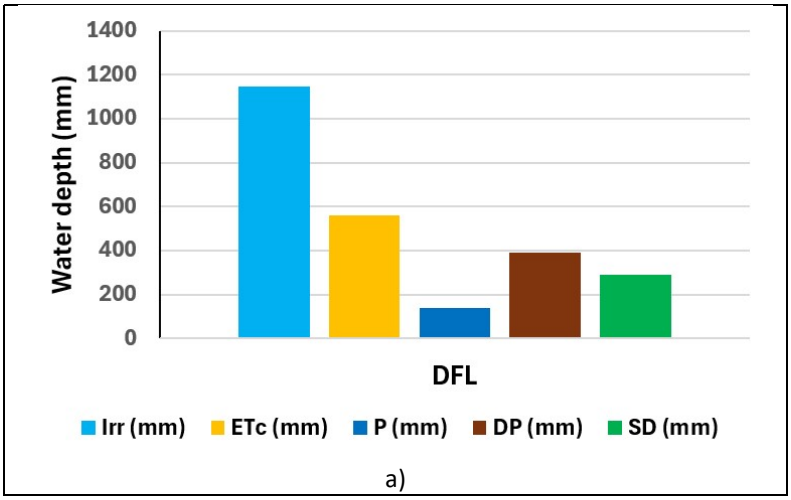


Figure 4. Average values of DFL water irrigation use. Legend: Irr – irrigation depth, ETc – crop evapotranspiration, P – precipitation during crop season, DP – paddies deep percolation, SD – paddies surface drainage

The seasonal irrigation depth of DFL – 1150 mm, was lower than the WFL – 1370 mm, showing the advantage of DFL on water saving, with a SD of 290 mm (less 32% than WFL) and deep percolation of 390 mm (less 17% than WFL). The average yield of 6.53 t/ha was identical to the WFL.

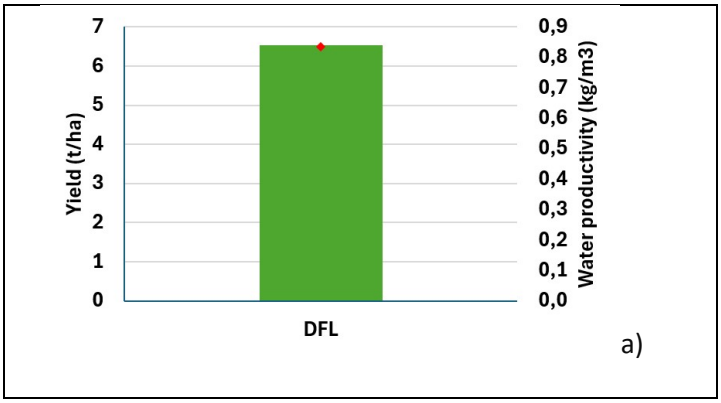


Figure 5. Average values of yield or land productivity (ton/ha, whole grain 14% humidity) of DFL.

EFFECTS ON NITROGEN WATER POLLUTION

Results effects DFL on nitrogen water pollution are presented in Figure 6, showing the average value of nitrates and ammoniacal.

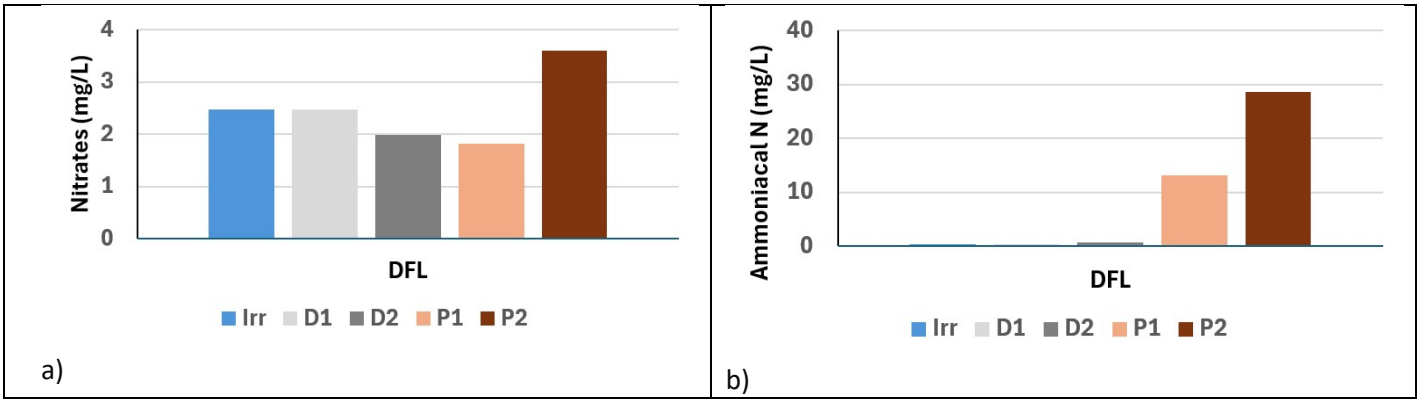


Figure 6. Average values of nitrates and ammoniacal of DFL.

It was observed that nitrates do not increase on surface drainage from upstream D1 to downstream D2, showing that rice paddies do not have pollution effect on SD. On the contrary, on subsurface water, the nitrate values increase from upstream P1 to downstream P2. This result highlights the importance of better rationalizing nitrogen fertilization. The ammoniacal nitrogen in irrigation water and surface drainage has very low values, and on the contrary, higher values were found in the subsurface water, increasing from upstream P1 to downstream P2, reflecting the effect of significant fertilization with ammoniacal nitrogen.

MANAGEMENT RECOMMENDATIONS

1. Carefully maintain soil preparation and precision land levelling practices, allowing for rigorous control of field water levels and water saving.
2. Monitor the electrical conductivity of irrigation and drainage water, especially in high-risk areas, to mitigate the negative effects of salinity.
3. Soil preparation and sowing operations must be handled with great care and rigor, given the potential risks to productivity due to the reduced soil moisture content at sowing. The possibility of basin flooding prior to sowing should be taken into consideration in dry years.